

IN THE CLAIMS:

1. (previously amended) An indicium for placement on a workpiece for use in determining whether the workpiece is valid, comprising:

a set of one or more markings corresponding to a string that is based upon, at least in part, intrinsic physical characteristics of at least one portion of said workpiece, said physical characteristics including one or more images of surface topographical appearance of said at least one portion of said workpiece resulting when the at least one portion of said workpiece is illuminated with electromagnetic radiation simultaneously from different illumination positions relative to said at least one portion.

2. (original) An indicium according to claim 1, wherein said one or more markings comprise at least one of the following on said workpiece: a barcode, a sequence of digits, and a spread-spectrum marking.

3. (original) An indicium according to claim 1, wherein said workpiece comprises a postal mailpiece.

4. (original) An indicium according to claim 1, wherein said workpiece comprises a postal mailpiece, and said string is also representative of a postage value associated with said mailpiece, if said workpiece is valid.

5. (original) An indicium according to claim 4, wherein said indicium is imprinted on said mailpiece by an apparatus, and said string also identifies the apparatus, if said workpiece is valid.

6. (original) An indicium according to claim 5, wherein said string is based upon respective numerical values representative of: one or more hash values representative of said characteristics, said postage value, and an identification value identifying said apparatus.

7. (original) An indicium according to claim 1, wherein the different positions are at respective different oblique angles, and an identical azimuthal angle, relative to the at least one portion of the workpiece.

8. (original) An indicium according to claim 1, wherein the different positions are at respective different azimuthal angles, and an identical oblique angle, relative to the at least one portion of the workpiece.

9. (original) An indicium according to claim 1, wherein a portion of the radiation is reflected from the at least one portion at an angle that is normal to a surface of the at least one portion, and the one or more images are generated from said portion of the radiation.

10. (original) An indicium according to claim 1, wherein the radiation comprises coherent light.

11. (original) An indicium according to claim 1, wherein the at least one portion comprises a plurality of portions of the workpiece.

12. (original) An indicium according to claim 1, wherein said string is based upon, at least in part, a concatenation of a plurality of numerical hash values derived from said one or more images.

13. (previously amended) An indicium according to claim 1, wherein said string

is based upon, at least in part, differences between selected images.

14. (previously amended) Apparatus for use in generating a string for use in determining whether a workpiece is valid, comprising:

an electromagnetic radiation source for illuminating at least one portion of the workpiece with electromagnetic radiation simultaneously from different illumination positions relative to said at least one portion;

an imaging device for generating one or more images of surface topographical appearance of said at least one portion when the at least one portion is illuminated with the radiation by the source at the different illumination positions; and

a string generator that generates the string based upon, at least in part, the one or more images.

15. (original) Apparatus according to claim 14, further comprising a mechanism that marks the workpiece with a set of one or more markings corresponding to at least one of a signature from a certifying authority (CA) and the string, the signature being based upon the string and a cryptographic key of the CA.

16. (original) Apparatus according to claim 15, wherein said one or more markings comprise at least one of the following on said workpiece: a barcode, a sequence of digits, and a spread-spectrum marking.

17. (original) Apparatus according to claim 15, wherein said workpiece comprises a postal mailpiece.

18. (original) Apparatus according to claim 15, wherein said workpiece comprises postal mailpiece, and said string is also representative of a postage value

associated with said mailpiece, if said workpiece is valid.

19. (original) Apparatus according to claim 18, wherein said one or more markings are imprinted on said mailpiece, and said string is also identifies the apparatus, if said workpiece is valid.

20. (original) Apparatus according to claim 19, wherein said string is based upon respective numerical values representative of: one or more hash values representative of said appearance, said postage value, and an identification value identifying said apparatus.

21. (original) Apparatus according to claim 14, wherein the different positions are at respective different oblique angles, and an identical azimuthal angle, relative to the at least one portion of the workpiece.

22. (original) Apparatus according to claim 14, wherein the different positions are at respective different azimuthal angles, and an identical oblique angle, relative to the at least one portion of the workpiece.

23. (original) Apparatus according to claim 14, wherein a portion of the radiation is reflected from the at least one portion at an angle that is normal to a surface of the at least one portion, and the one or more images are generated from said portion of the radiation.

24. (original) Apparatus according to claim 14, wherein the radiation comprises coherent light.

25. (original) Apparatus according to claim 14, wherein the at least one portion comprises a plurality of portions of the workpiece.

26. (original) Apparatus according to claim 14, wherein said string is based upon, at least in part, a concatenation of a plurality of numerical hash values derived from said one or more images.

27. (previously amended) Apparatus according to claim 14, wherein said string is based upon, at least in part, differences between selected images.

28. (currently amended) Method for generating a string for use in determining whether a workpiece is valid, comprising:

illuminating at least one portion of the workpiece with electromagnetic radiation from different illumination positions relative to said at least one portion;

generating one or more images of surface topographical appearance of said at least one portion when the at least one portion is illuminated with the radiation at the different illumination positions;

filtering the one or more images to produce one or more filtered images in which selected higher spatial frequencies of the one or more images are emphasized and lower frequencies are attenuated to distinguish signal components representing taller and deeper surface topographical features from noise and signal components representing shorter and shallower surface topographical features; and

generating the string based upon, at least in part, the one or more filtered images.

29. (original) Method according to claim 28, further comprising marking the workpiece with a set of one or more markings corresponding to at least one of a signature from a certifying authority (CA) and the string, the signature being based upon the string

and a cryptographic key of the CA.

30. (original) Method according to claim 29, wherein said one or more markings comprise at least one of the following on said workpiece: a barcode, a sequence of digits, and a spread-spectrum marking.

31. (original) Method according to claim 28, wherein said workpiece comprises a postal mailpiece.

32. (original) Method according to claim 29, wherein said workpiece comprises a postal mailpiece, and said string is also representative of a postage value associated with said mailpiece, if said workpiece is valid.

33. (original) Method according to claim 32, wherein said one or more markings are imprinted on said mailpiece by an apparatus, and said string also identifies the apparatus, if said workpiece is valid.

34. (original) Method according to claim 33, wherein said string is based upon respective numerical values representative of: one or more hash values representative of said appearance, said postage value, and an identification value identifying said apparatus.

35. (original) Method according to claim 28, wherein the different positions are at different oblique angles, and an identical azimuthal angle, relative to the at least one portion of the workpiece.

36. (original) Method according to claim 28, wherein the different positions are at respective different azimuthal angles, and an identical oblique angle, relative to the at least one portion of the workpiece.

37. (original) Method according to claim 28, wherein a portion of the radiation is reflected from the at least one portion at an angle that is normal to a surface of the at least one portion, and the one or more images are generated from said portion of the radiation.

38. (original) Method according to claim 28, wherein the radiation comprises coherent light.

39. (original) Method according to claim 28, wherein the at least one portion comprises a plurality of portions of the workpiece.

40. (original) Method according to claim 28, wherein said string is based upon, at least in part, a concatenation of a plurality of numerical hash values derived from said one or more images.

41. (previously amended) Method according to claim 28, wherein said string is based upon, at least in part, differences between the selected images.

42. (previously amended) Computer-readable memory comprising computer-executable program instructions for use in generating a string for use in determining whether a workpiece is valid, the instructions when executed causing:

illumination of at least one portion of the workpiece with electromagnetic radiation simultaneously from different illumination positions relative to said at least one portion;

generation of one or more images of surface topographical appearance of said at least one portion when the at least one portion is illuminated with the radiation at the different illumination positions; and

generation of the string based upon, at least in part, the one or more images.

43. (original) Memory according to claim 42, wherein the instructions when executed also cause marking of the workpiece with a set of one or more markings corresponding to at least one of a signature from a certifying authority (CA) and the string, the signature being based upon the string and a cryptographic key of the CA.

44. (original) Memory according to claim 43, wherein said one or more markings comprise at least one of the following on said workpiece: a barcode, a sequence of digits, and a spread-spectrum marking.

45. (original) Memory according to claim 42, wherein said workpiece comprises a postal mailpiece.

46. (original) Memory according to claim 43, wherein said workpiece comprises a postal mailpiece, and said string is also representative of a postage value associated with said mailpiece, if said workpiece is valid.

47. (original) Memory according to claim 46, wherein said one or more markings are imprinted on said mailpiece by an apparatus, and said string also identifies the apparatus, if said workpiece is valid.

48. (original) Memory according to claim 47, wherein said string is based upon respective numerical values representative of: one or more hash values representative of said appearance, said postage value, and an identification value identifying said apparatus.

49. (original) Memory according to claim 42, wherein the different positions are at respective different oblique angles, and an identical azimuthal angle, relative to the at least one portion of the workpiece.

50. (original) Memory according to claim 42, wherein the different positions are at respective different azimuthal angles, and an identical oblique angle, relative to the at least one portion of the workpiece.

51. (original) Memory according to claim 42, wherein a portion of the radiation is reflected from the at least one portion at an angle that is normal to a surface of the at least one portion, and the one or more images are generated from said portion of the radiation.

52. (original) Memory according to claim 42, wherein the radiation comprises coherent light.

53. (original) Memory according to claim 42, wherein the at least one portion comprises a plurality of portions of the workpiece.

54. (original) Memory according to claim 42, wherein said string is based upon, at least in part, a concatenation of a plurality of numerical hash values derived from said images.

55. (previously amended) Memory according to claim 42, wherein said string is based upon, at least in part, differences between selected images.

56. (previously amended) An indicium according to claim 1, wherein the string is based upon, at least in part, a numerical hash value being generated by a process that includes filtering the one or more images to produce one or more filtered images in which selected higher spatial frequencies of the one or more images are emphasized and the lower spacial frequencies are attenuated or ignored and manipulating the one or more filtered images.

57. (previously amended) An indicium according to claim 56, wherein the one or more filtered images further de-emphasize selected lower spatial frequencies.

58. (previously amended) An indicium for placement on a workpiece for use in determining whether the workpiece is valid, comprising:

a set of one or more markings corresponding to a string that is based upon, at least in part, intrinsic physical characteristics of at least one portion of said workpiece, said physical characteristics including one or more images of surface topographical appearance of said at least one portion of said workpiece resulting when the at least one portion of said workpiece is illuminated with electromagnetic radiation from different illumination positions relative to said at least one portion,

the string being further based upon, at least in part, a numerical hash value derived from the one or more images, the value being generated by a process that includes extracting from the one or more images a first image portion scaling the first image portion to generate a scaled image portion, averaging pixel value of the scaled image portion to generate a first filtered image, extracting from the first filtered image a second image portion, averaging pixel values of the second image portion to generate a second filtered image, and subtracting corresponding pixel value of the second filtered image from the second image portion to generate a third filtered image.

59. (previously amended) Apparatus according to claim 14, wherein

the imaging device filters the one or more images to produce one or more filtered images in which selected higher spatial frequencies of the one or more images are emphasized,

the string generator generates the string based upon, at least in part, the one or more filtered images.

60. (previously amended) Apparatus according to claim 59, wherein the filtering of the one or more images further de-emphasizes selected lower spatial frequencies.

61. (previously amended) Apparatus for use in generating a string for use in determining whether a workpiece is valid, comprising:

an electromagnetic radiation source for illuminating at least one portion of the workpiece with electromagnetic radiation from different illumination positions relative to said at least one portion;

an imaging device for generating one or more images of surface topographical appearance of said at least one portion when the at least one portion is illuminated with the radiation by the source at the different illumination positions; and

a string generator that generates the string based upon, at least in part, a numerical hash value derived from the one or more images, the value being generated by a process that includes extracting from the one or more images a first image portion, scaling the first image portion to generate a scaled image portion, averaging pixel values of the scaled image portion to generate a first filtered image, extracting from the first filtered image a second image portion, averaging pixel values of the second image portion to generate a second filtered image, and subtracting corresponding pixel values of the second filtered image from the second image portion to generate a third filtered image.

62. (original) Method according to claim 28, wherein the at least one portion is

illuminated with the radiation simultaneously from the different illumination positions.

63. (previously amended) Method according to claim 28, wherein the filtering step further includes filtering the one or more images to produce filtered images in which selected lower spatial frequencies are de-emphasized.

64. (previously amended) Method according to claim 28, wherein the sting is based upon, at least in part, a numerical hash value derived from the one or more filtered images, the value being generated by a process that includes extracting from the one or more images a first image portion, scaling the first image portion to generate a scaled image portion, averaging pixel values of the scaled image portion to generate a first filtered image, extracting from the first filtered image a second image portion, averaging pixel values of the second image portion to generate a second filtered image, and subtracting corresponding pixel values of the second filtered image from the second image portion to generate a third filtered image.

65. (previously amended) Memory according to claim 42, further causing filtering of the one or more images to produce one or more filtered images in which selected higher spatial frequencies of the one or more images are emphasized.

66. (previously amended) Memory according to claim 65, wherein the filtering further de-emphasizes selected lower spatial frequencies.

67. (previously amended) Computer-readable memory comprising computer-executable program instructions for use in generating a string for use in determining whether a workpiece is valid, the instructions when executed causing:

illumination of at least one portion of the workpiece with electromagnetic

radiation from different illumination positions relative to said at least one portion;

generation of one or more images of surface topographical appearance of said at least one portion when the at least one portion is illuminated with the radiation at the different illumination positions; and

generation of the sting based upon, at least in part, a numerical hash value derived from the one or more images, the value being generated by a process that includes extracting from the one or more images a first image portion, scaling the first image portion to generate a scaled image portion, averaging pixel values of the scaled image portion to generate a first filtered image, extracting from the first filtered image a second image portion, averaging pixel values of the second image portion to generate a second filtered image, and subtracting corresponding pixel values of the second filtered image from the first filtered image to generate a third filtered image.

68. (original) An indicium according to claim 1, wherein the one or more images are generated using one of a linear array of photosensing elements, a two-dimensional array of photosensing elements and a single photosensing element.

69. (original) Apparatus according to claim 14, wherein the imaging device comprises one of a linear array of photosensing elements, a two-dimensional array of photosensing elements and a single photosensing element.

70. (original) Method according to claim 28, wherein the one or more images are generated using one of a linear array of photosensing elements, a two-dimensional array of photosensing elements and a single photosensing element.

71. (original) Memory according to claim 42, wherein the one or more images

are generated using one of a linear array of photosensing elements, a two-dimensional array of photosensing elements and a single photosensing element.

72. (original) An indicium according to claim 1, wherein the indicium uniquely identifies the workpiece.

73. (original) Apparatus according to claim 14, wherein the string uniquely identifies the workpiece.

74. (original) Method according to claim 28, wherein the string uniquely identifies the workpiece.

75. (original) Memory according to claim 42, wherein the string uniquely identifies the workpiece.

76. (original) An indicium according to claim 1, wherein the string is based, at least in part, upon an averaging of portions of the one or more images.

77. (original) An inidicium according to claim 1, wherein the string is based, at least in part, upon a calculation of principal components of the one or more images.

78. (original) Apparatus according to claim 14, wherein the string is based, at least in part, upon an averaging of portions of the one or more images.

79. (original) Apparatus according to claim 14, wherein the string is based, at least in part, upon a calculation of principal components of the one or more images.

80. (original) Method according to claim 28, wherein the string is based, at least in part, upon an averaging of portions of the one or more images.

81. (original) Method according to claim 28, wherein the string is based, at least in part, upon a calculation of principal components of the one or more images.

82. (original) Memory according to claim 42, wherein the string is based, at least in part, upon an averaging of portions of the one or more images.

83. (original) Memory according to claim 42, wherein the string is based, at least in part, upon a calculation of principal components of the one or more images.